



SKILLSHEET 15.6

Theoretical probability

The theoretical probability of any event is given by the rule:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

WORKED EXAMPLE

A marble is selected from a bag containing 3 red, 5 white and 7 blue marbles. Find the probability that the marble is:

- a** white **b** not blue.

THINK

- a**
- 1 Write the formula for calculating theoretical probability.
 - 2 Write the number of favourable outcomes (that is, the number of white marbles).
 - 3 Write the total number of possible outcomes.
Total is $3 + 5 + 7 = 15$ marbles.
 - 4 Substitute the values into the formula for theoretical probability and evaluate.
- b**
- 1 Write the number of marbles that are not blue (that is, number of red and white marbles).
 - 2 Write the total number of possible outcomes.
 - 3 Substitute the values into the formula for theoretical probability and evaluate.

WRITE

a $P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$

Number of favourable outcomes = 5

Total number of possible outcomes = 15

$$P(\text{white}) = \frac{5}{15} \\ = \frac{1}{3}$$

b Number of favourable outcomes = 8

Total number of possible outcomes = 15

$$P(\text{not blue}) = \frac{8}{15}$$

Try these

Questions **1** to **5** refer to the following information.

A marble is drawn from a bag containing 3 green, 4 yellow, 2 white and 1 purple marble.

- 1** What is the probability that the marble is yellow?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{yellow}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots}{\dots\dots}$$

$$\dots\dots$$

$$= \frac{\dots\dots}{\dots\dots}$$

$$\dots\dots$$



- 2 What is the probability that the marble is purple?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{purple}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$
$$= \frac{\dots\dots}{\dots\dots}$$

- 3 What is the probability that the marble is either white or green?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{white or green}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$
$$= \frac{\dots\dots}{\dots\dots}$$
$$= \frac{\dots\dots}{\dots\dots}$$

- 4 What is the probability that the marble is not green?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{not green}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$
$$= \frac{\dots\dots}{\dots\dots}$$

- 5 What is the probability that the marble is neither purple nor green?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{neither purple nor green}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$
$$= \frac{\dots\dots}{\dots\dots}$$
$$= \frac{\dots\dots}{\dots\dots}$$

Questions 6 to 10 refer to the following information.

A 'brainy shapes' child play-kit contains 10 squares, 15 triangles, 20 rectangles, 15 circles and 10 parallelograms. One shape is selected from the box.

- 6** What is the probability that the shape is a circle?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{circle}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

- 7** What is the probability that the shape is a parallelogram?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{parallelogram}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

- 8** What is the probability that the shape is either a rectangle or a square?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{rectangle or square}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$= \frac{\dots\dots\dots}{\dots\dots\dots}$$

- 9 What is the probability that the shape is not a triangle?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{not a triangle}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots}{\dots\dots}$$

$$= \frac{\dots\dots}{\dots\dots}$$

- 10 What is the probability that the shape is a quadrilateral (4-sided)?

Number of favourable outcomes =

Total number of possible outcomes =

$$P(\text{quadrilateral}) = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

$$= \frac{\dots\dots}{\dots\dots}$$

$$= \frac{\dots\dots}{\dots\dots}$$

SKILLSHEET — ANSWERS

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Theoretical probability

1 $\frac{2}{5}$

3 $\frac{1}{2}$

5 $\frac{3}{5}$

7 $\frac{1}{7}$

9 $\frac{11}{14}$

2 $\frac{1}{10}$

4 $\frac{7}{10}$

6 $\frac{3}{14}$

8 $\frac{3}{7}$

10 $\frac{4}{7}$